

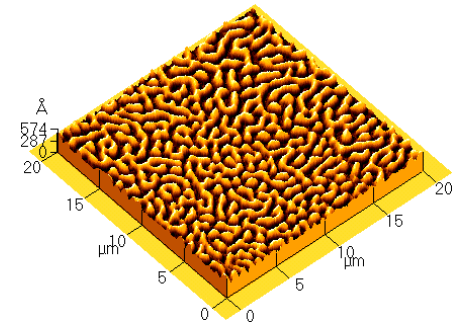
Wetting of structured liquid films

P.F. Green DMR0072898

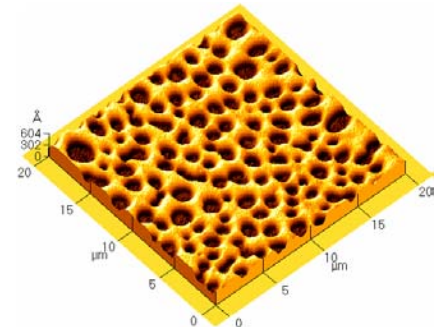
The wetting of a small microscopic droplet on a substrate is determined by capillarity. On the other hand long-range intermolecular and short-range, chemical, interactions influence the wetting properties of thin homopolymeric liquid films in the nanometer thickness range on substrates. Such interactions involving the substrate may induce the film to restructure and form various topographical patterns.

In the case of an A-B diblock copolymer the situation is particularly interesting. In the bulk, at temperatures below an order-disorder transition (T_{ODT}), these materials exhibit an intrinsic ability to self-assemble into different geometrical structures; for $T > T_{\text{ODT}}$, thermodynamics favors intermixing of the A and B segments. In thin supported films, when $T > T_{\text{ODT}}$, the substrate forces the molecules to self organize and the relative interactions between the A and B components near the substrate have a particularly strong influence on the wetting properties. These images reveal two topographical patterns that such films are capable of forming due to such interactions. The patterns are similar to those formed by homopolymers due to entirely different intermolecular interactions.

(Invited feature Article in J. Polym. Sci.: Polymer Physics 41, 2219 (2003))



Spinodal



Nucleation and growth

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Education

One undergraduate and 5 graduate students, two of which have graduated, Jean-Loup Masson (Novacel, France), Ratchana Limary (Intel, Ca), Brian Besancon, Luciana Meli and Jamie Kropka, have contributed to the research on wetting and stability of thin liquid films on substrates.

Outreach

Various students in the research group, Joseph Pham and Luciana actively perform demonstrations in local elementary and Middle schools on related topics in the area of polymers



Members of the Green research group (7) and spouses celebrate the successful completion of 2 Ph.D degrees, Joseph Pham and Karl Putz. NSF was largely responsible for their support